Integrated Life-Cycle Base Camp Sustainment

By Richard M. Marlatt

Introduction

As the Army transforms and expects to occupy a smaller footprint in theater, strategic base camp planning becomes critical. The current fragmented approach to design, construction, and operation needs to be re-engineered to exploit information technology and integrate base camp management throughout the life cycle. The U.S. Army Engineer Research and Development Center (ERDC) has several ongoing efforts to address different components of this challenge. The goal is to provide a suite of integrated tools that will become a module within another set of tools, called Fort Future, which ERDC is developing to support installation transformation through modeling and simulation.

Current Situation

For planning base camps (intermediate staging, forward operating and forward staging), the Theater Construction Management System (TCMS) is the only automated tool available to military engineers. TCMS, developed by ERDC's Construction Engineering Research Laboratory (CERL) in the 1980s, has been used successfully but addresses only design and construction. Those responsible for theater engineering need TCMS' capability plus a means to make intelligent, life-cycle base camp sustainment decisions. This includes not only design and construction planning, but also force protection, environmental considerations, health and safety issues, base operation, transfer and closure.

Doctrine for the design of base camps is weak, although Field and Technical manuals abound. Site selection techniques also are less than ideal. There is a lack of general engineering, environmental baseline documentation, and sanitation input. The design is for an initial standard, but it usually becomes a temporary standard. The lack of strategic planning also contributes to high annual operating costs for base camps. For example, Defense Secretary Donald Rumsfield noted during a June 2001 visit that Camp Bondsteel incurs a $148M cost per year, which resulted in the Undersecretary of Defense Comptroller sending a memorandum to the Secretary of the Army recommending that costs be reduced. Finally, bases take time to deconstruct and these activities can harm the ecosystem if environmental concerns are not addressed.

An Integrated Process

CERL leads an ERDC project to develop planning decision support tools that provide the forces an expedient forward infrastructure to meet requirements for rapid deployment, minimal logistics tail, and safe haven. These tools focus on maximum use of locally available materials, infrastructure, and utilities, resulting in a minimum permanent footprint that meets functional, operational, environmental, and other requirements. The intent is to provide base camp equivalent facilities within 15 days of troop deployment.

A totally integrated base camp facility management decision support tool would encompass general engineering, environmental baseline information, field sanitation, force protection, and environmental issues over the life cycle of a base camp. Shifting the focus from just initial design to consider operation and maintenance, as well as environmental considerations, in an integrated, life-cycle manner is a unique and logical way in which to manage base camps. The final product would become one of the standard Fort Future modules, the Forward Facilities Module. Fort Future would then become a more comprehensive tool providing support to a continuum of facilities.

The main objective of integrated base camp management is to accommodate a safe, healthy force capable of accomplishing the assigned mission and maintaining combat power. Other specific benefits are:

- Reduced logistic packaging loads (e.g., fewer shipping containers).
- Decreased costs for land restoration, land damage payments, and equipment maintenance
- Base camps with more efficient layouts, improved force protection, and reduced logistics footprint (economy of force). Soldiers realize improved quality of life in theater through rapid planning and time-phased logistics.
- Ability to develop a five-phase master plan within 24 hours of receiving minimal site data.
- Ability to provide a base camp master plan (including Bill of Materials) with minimum construction logistics tail, permanent footprint, and cost within 24 hours of obtaining minimal site data.

ERDC currently has four ongoing projects to develop information, systems, and processes to support this integrated tool. Multiple agencies are involved in these developmental efforts.

Base Camp Planning

Work on this tool began in FY01 at ERDC and leverages aspects of the U.S. Air Force's (USAF) GeoReach initiative. A contractor for USAF developed a base conceptual planning system called Geographical Base Engineer Survey Toolkit (GeoBEST). ERDC's work focuses on developing sustainment models to rapidly assess mission needs and generate facility requirements for adjacency, minimum standoff and utilities; constraint-based layout techniques that support rapid base camp planning and dynamic reconfiguration; and an underlying facility model that supports automatic explosive threat analysis and environmental baseline data.

The intent is to enhance the Air Force tool with decision- support technologies developed for conventional Continental United States (CONUS) facility planning, design and construction as part of CERL's engineering automation research and with anti-terrorist, logistics, and other military engineering tools from ERDC's Geotechnical and Structures Laboratory (GSL). This work is also being coordinated with the Corps of Engineers Huntsville Engineering and Support Center.

GeoBest will include interfaces to existing ERDC tools, including Anti-Terrorist Planner, Theater Construction Management System/Army Facilities Components System (TCMS/AFCS), Tele-Engineering Tool Kit, Terrain Modeling System, and Mobile Combat System-Engineer (MCS-Eng).

This decision-support tool will help military engineers develop a comprehensive list of facility and infrastructure requirements, and then decide where and how best to provide those facilities using a 3-dimensional, geo-referenced map of the site. The planner will be able to construct alternative scenarios and compare the time, cost and logistics required to modify or upgrade existing facilities with the construction of rapidly erectable temporary facilities.

High-Performance Conventional Contingency Facilities

This ERDC project identifies Class IV reduction opportunities for conventional semi-permanent construction. Currently, construction of buildings in theater takes too long, costs too much, and ties up critical transportation resources. Previous contingency operations (e.g., up to 24 months in duration) have shown that forward operating base vertical construction materials constitute one-third of the Class IV supply.

The South East Asia hut (SEAhut), a commonly used semi-permanent construction facility, is the initial case study for this work. SEAhuts use standard dimensional lumber and plywood construction and have been built for base camps in Vietnam, Kosovo, and Guantanamo Bay. They provide adequate shelter against the weather and a temporary solution

to housing forces for operations that exceed 6 months in duration. However, this conventional construction requires large quantities of Class IV supplies that generate logistical problems.

ERDC's research is exploring optimum value engineering and materials substitution to provide designs that can reduce the Class IV burden. Optimum value engineering will eliminate unnecessary design redundancies. Innovative materials substitution focuses on researching standard and hybrid sections (e.g., engineered wood composite) to develop new sections that inherit the best properties of their components. From the research various design configurations will be generated and their sub-systems evaluated. The capacity of these sub-systems will be assessed against their construction weight, volume, and constructibility requirements.

Contributors to be brought on board when appropriate include: ERDC-GSL's Base Camp Survivability Branch for materials procurement knowledge; the Army Engineer School's Maneuver Support Center for engineer training doctrine; 412th/416th Engineering Command, Naval Mobile Construction Battalion and/or Air Force Red Horse Civil Engineering Squadron units for combat construction doctrine and knowledge; Huntsville Center for logistics and forward operating base requirements; and Kellogg, Brown & Root for practical contractor experience.

In-Theater Infrastructure Assessment

One way to support rapid military deployment and reduce the Class IV materials needed in theater operations is by using or adapting the existing infrastructure. To ensure the adequacy of this infrastructure, theater engineers need tools to locate, inventory and assess the condition of buildings and utilities. As part of this effort, ERDC is studying the feasibility of using remote assessment of infrastructure to identify, sort, prioritize, and make initial evaluations. Once on the ground, the troops and engineers could perform more detailed inspections using simplified methods, checklists, design and material libraries, and a centralized reach-back capability with skilled engineers who assist in finding and resolving complex problems.

The scoping phase of this project is looking at multiple approaches that would help engineers and troops in the field better use existing infrastructure. A close look at lessons learned from recent mobilization efforts will be an important early step. Proponents within DoD will be identified and invited to participate in a base camp workshop scheduled to take place in FY04. The lessons learned, workshop, and investigation of current standards and promising technologies will be used to focus the research efforts where the most effective improvements can be made. The following activities are being considered:

- Develop a database (or the framework and tools for collecting the data) of existing OCONUS infrastructure.
- Benchmark infrastructure based on local practices
- Develop applications of remote assessment technologies for buildings and utilities
- Develop assessment tools for engineers (building component inventories, inspection checklists, guidance and self-contained reference materials)
- Develop assessment tools for soldiers (simplified methods)
- Produce standards for gathering information to optimize use of ERDC's Tele-Engineering Operations Center
- Provide rapid restoration techniques for utilities and buildings
- Document innovative repair methods (e.g., using indigenous resources)

The findings will be used to focus research and development on tools that will assist in rapid theater inventory, condition assessment, planning, and repair of existing structures to meet the functional demands.

Utilities Technology Selection

During deployments, the Army establishes base camps in a wide variety of situations. Site conditions such as the status of existing infrastructure and the baseline environmental assessment impact how base camps can be deployed, and thus how utilities can be provided. Because each base camp scenario is unique, the Army must depend on an array of utility technologies to serve base camps needs. Selection is based on: pre-existing site conditions, environmental baseline assessment, number of troops, and duration of stay.

ERDC will prepare a matrix of base camp technologies that can provide utility services for water treatment and distribution, wastewater collection and disposal, solid waste disposal, and electric power generation under various deployment scenarios. Information in the matrix comes from: a study completed in FY02; deployment doctrine; agencies active in supporting Army deployments; and military and civilian individuals with deployment experience. The matrix includes existing technologies, technologies under development, and commercial-off-the-shelf technologies that could be adapted to deployment scenarios.

Based on the matrix, ERDC will estimate the impact that existing technologies have on deployments and determine the potential impact of replacing ineffective technologies with more effective ones. Evaluation of this impact will be based on mission, deployment logistics, cost, security, and quality of life for the soldier.

In the next phase of the research, ERDC will develop, or partner in the development of, technologies necessary to fill high-priority elements of the matrix. It is anticipated that technologies related to solid waste processing and wastewater sludge disposal will be developed. However, it is possible that other technology gaps with higher priority will take precedence. Any new technologies developed will be field-tested and validated prior to recommendation.

For this work, ERDC will consult or partner with the Soldier Support Center at Natick Laboratories; the Air Force Research Laboratories at Tyndall Air Force Base; and other Corps of Engineers offices and laboratories

Conclusion

Integrated life-cycle base camp management tools support Transformation objectives by providing better designed contingency facilities faster, with less logistics tail and smaller footprint, and at lowest cost to ensure soldiers' comfort, health, safety, and combat readiness. Through an integrated approach, environmental, communications, force protection, and other issues can be considered simultaneously in planning and management rather than piecemeal or after the camp is built. These tools will help ensure the base camp's sustainability from design through disposal.

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